PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

ENERGY DIVISION **RESOLUTION E-3922**
APRIL 21, 2005

RESOLUTION

Resolution E-3922. Pacific Gas and Electric (PG&E) proposed a market-based method for a customer value of service (VOS) study. The Commission denies the request and requires PG&E to use a survey-based method instead.

By Advice Letter 2616-E Filed on January 21, 2005.

SUMMARY

This Resolution denies PG&E's proposal to use a market-based approach for a value of service (VOS) study. PG&E was directed to update prior VOS estimates and to determine how they have changed since PG&E last conducted a VOS study for each customer class in 1993.

If the market-based approach were used for this study the results could not be compared or combined with the 1993 study because the data, assumptions and methods all differ. Instead PG&E is directed to use the alternative survey-based approach it also describes in AL 2616-E, in order to leverage the 1993 survey-based results.

PG&E may record debit entries to a Streamlining Residual Account equal to the amounts of study's invoices. However, invoices are limited to scope of work required under D.04-10-034, and the Streamlining Residual Account is subject to review before recovery in rates.

BACKGROUND

D.04-10-034 in PG&E's 2003 General Rate Case Ordered a VOS Study

In Application (A.) 02-11-017, Pacific Gas and Electric's (PG&E) Test Year (TY) 2003 General Rate Case (GRC) application the Commission issued Decision (D) 04-10-034. Ordering Paragraph 6 of the decision required PG&E to perform a customer VOS study prior to their next GRC. The Decision also specified that the new VOS study, at a minimum, should include a "willingness to pay (WTP)" element. It also ordered PG&E to file an Advice Letter with the Commission within 90 days or by February 8, 2005, detailing its proposed VOS study approach and cost estimate for Commission review and approval. PG&E submitted an Advice Letter on January 21, 2005 and recommended the Commission choose a market-based method over a survey-based method for it to conduct the required customer VOS study.

VOS Results Allow PG&E and the Commission to Make Informed Decisions

This study is intended to update prior VOS estimates and determine how these values have changed since the last PG&E VOS study conducted for each customer class in 1993. Value of Service information allows PG&E to make cost effective decisions in resource planning and revenue allocation that are consistent with customer's desires. It also allows the Commission to better evaluate performance incentive mechanisms and funding proposals.

Three Methods of Doing a VOS Study are 1) Proxy; 2) Survey (Contingent Valuation); and 3) Market-Based

A Value of Service study (also called an outage cost study) provides a means to quantify the value customers place on reliable electric service. According to the AL, the economic value of utility service reliability is equal to the economic losses resulting from service interruptions and power quality problems. The three methods commonly used to quantify VOS are:

- The **Proxy** method involves simple calculations to infer customer Willingness-to-Pay (WTP) using secondary data such as average electricity rates, cost of owning and operating backup generation, wage rates, and Gross Domestic Product (GDP) per kWh.
- **Contingent Valuation (CV or Survey-based)** methods use surveys to elicit customer response. There are three valuation methods depending on

customer segment: 1) the amount a customer is willing to pay to avoid an outage (Willingness-to-Pay or WTP), 2) the amount a customer is willing to receive in order to accept an outage (Willingness-to-accept or WTA), and 3) the specific costs and savings from an outage (Direct Costs). Outage costs are the costs minus the savings from an outage.

- **Market-based** methods infer WTA and/or WTP based on: 1) consumer surplus (area under the demand curve net of bill payment), 2) customer choice of non-firm rate options, 3) customer backup generation ownership, 4) industrial firm lost profit due to power outages.

Of the three methods PG&E recommended the Commission consider either the survey-based method proposed by the Freeman, Sullivan & Company (FSC) or the market-Based method proposed by the Energy and Environmental Economics Inc. (E3).

The VOS study is to address the customer classes of residential, small/medium commercial/industrial, large commercial/industrial, and agricultural. Because the Proxy method would not be able to do so PG&E did not propose using it.

The Survey-based Method Proposed by FSC Would Compare Data from Prior Surveys with Data from New Surveys

FSC conducted a recent study for the Lawrence Berkeley National Laboratory to create a meta-database by combining 24 individual VOS studies conducted by electric utilities across the United States. The approach is valid because all the studies used a common methodology. FSC proposed to integrate results of the last PG&E survey with datasets available from the California market to develop a description of customer value of service prior to year 2000 for all of California, particularly PG&E customers. FSC also suggested that information from the meta-data base can be used to develop preliminary estimates of outage costs, to project probable results, and to fine tune sampling and data collection strategies of the 2005 VOS study.

The actual customer responses collected during the 2005 PG&E VOS surveys then will be added to the model to identify the extent of change in customer outage costs since the 1993 PG&E survey study.

FSC also proposed to develop separate surveys for each customer class. Data collection instruments and approaches would be tailored specifically for each of these customer segments.

The table on the following page shows the research approach and data collection strategies proposed by FSC for each customer segment:

Value of Service Survey Proposed by Freeman, Sullivan & Company (FSC)

Customer Segment	Sample Size	Data Collection Approach	Valuation Method
Residential	1,000	Mail	Direct Cost & Willingness to Pay
Small/Medium Commercial/Industrial	800	Telephone recruit, Mail	Direct Cost & Willingness to Pay
Large Commercial/Industrial	150	Telephone recruit, In-person Interview	Direct Cost
Agricultural	400	Telephone recruit, Mail	Direct Cost & Willingness to Pay

FSC proposed to analyze these data to produce and report outage cost estimates system-wide and by customer segments. FSC would present results in summary analysis tables and customer damage functions in the form of multiple regression equations. Then FSC would compare results of the 2005 surveys with their initial meta-data base projections.

FSC projected completing the study by September 1, 2005 with a total budget of $540,000.

FSC stated in response to a staff request to PG&E that the sample sizes proposed for the 2005 PG&E VOS study are designed to produce reliability in the +/- 15-20 percent range of the true population mean with 90 percent confidence depending on customer segment.

E3's Market-based Study Would Use Two Methods to Estimate WTP

<u>For Residential Customers the "Net Benefit of Consumption with Supply Availability Changes" Method Measures WTP</u>

Consumer surplus or net benefit is the area under the demand curve, minus the bill payment quantity times price. Consumer surpluses can be calculated for demand curves of high and low availabilities. The difference in consumer surpluses is WTP for the decline in availability. This method based on the idea that as reliability of electricity supply decreases, customers can not use as much

electricity as they would under high reliability. Customer may be able to make up some of the lost usage at the end of an outage, but there still would be a net loss in electricity usage. Hence, there is a loss in the customer's value of service.

For NonResidential Customers the "Cost of Production" Method Measures WTP
PG&E's AL states that this approach assumes that a cost-minimizing firm uses variable inputs like labor and electricity to produce an output, subject to electricity availability. When outages decrease and electric supply availability improves, a firm's variable product cost declines. WTP is the percentage change in average product cost per percentage change in electricity supply times the initial total product cost.

E3 would complete the entire project within six months of the contract award date with a total budget of $249,200.

E3 indicated that its study and the survey study likely have comparable confidence intervals. The 90% and 95% confidence intervals, however, are commonly cited.

NOTICE

Notice of AL 2616-E was made by publication in the Commission's Daily Calendar. PG&E states that a copy of the AL was mailed and distributed in accordance with Section III-G of General Order 96-A.

PROTESTS

PG&E's AL 2616-E was timely protested by the Aglet Consumer Alliance (Aglet), the Agricultural Energy Consumers Association (AECA), the Coalition of California Utility Employees (CUE), and The Utility Reform Network (TURN).

The protests raised the following major issues. PG&E's response on February 16, 2005 appears below each issue it addressed.

Reliability Hardly Affects Demand for Residential Customers

CUE and TURN suggested that since PG&E has a 99.95% reliable electric system, it would be almost impossible for E3 to determine the extent which changes in the frequency of very infrequent outage events cause demand curves to change,

while at the same time excluding the effects of larger drivers of electricity demand.
PG&E responded:

- There exists large variation in outage rates at a division level, even PG&E has an overall reliable electric system. E3 believes that the variation in usage due to outages will be statistically significant in a demand analysis using monthly consumption data by area.

CUE and TURN claimed that the market-based approach was based on an invalid assumption; namely, that residential customers are willing to pay more per unit of electricity, with increased electricity supply reliability.
PG&E responded:

- "Net Benefit of Consumption with Supply Availability Changes" Method for Residential Customers is based on the idea that customer net loss in electricity usage equates to loss in the customer's value of service. It doesn't mean that customers are willing to pay more for electricity just because they have higher reliability.

CUE and TURN disagreed with E3's assumption that "interruption-minutes per customer" are one of the major drivers of electricity demand. They questioned the impact of outages on electricity demand, compared to other factors such as income, electricity rates, and weather. Also, E3 did not explain how it would extract the impacts of reliability differences on demand curves from all other known causes.
PG&E responded:

- As long as usage varies with outage minutes, outage rate does not need to be a "major "driver to apply this method.

CUE and TURN indicated that customer behavior is not driven purely by economic theory. Aglet Consumer Alliance (Aglet) agreed with CUE and TURN that the VOS study should be based on actual customer responses, not a theory.
PG&E responded:

- E3's principal investigator has extensive electric industry experience in general and in VOS estimation. His publication records, especially in VOS estimation, mirrors the rigor and quality of his VOS research. E3 proposal contains a list of references and copies of key E3 papers cited in their proposal.

The Market-Based Approach May Exclude Results from Two-Thirds of PG&E's Customers

The demand curves produced by the VOS study reflect customer response to rate changes. CUE and TURN alleged that customers who use less than 130% of the baseline quantity would be excluded from the market-based study because their rates have not changed since before the passage of AB1x1. These customers form some 2/3 of PG&E's customer base.

PG&E responded:

- There is only 1/3 of PG&E's residential customers had bills that remained at or below the 130% baseline for the entire year. At the aggregate level of operating area, division, or county; the fact that rates have not changed for a subset of the population is not an issue. The usage and cost data for the small customers remain valid components of the area averages.

Under the Market-Based Approach PG&E Could Not Measure Changes since the Energy Crisis, or Compare Current VOS Study Results with Past Results

CUE and TURN indicated that E3 using historical data before and after the California energy crisis in the market-based study would not produce current VOS results, and would not be able to measure changes in VOS since the energy crisis. Furthermore, since the market-based approach is a new method, the results could not be compared with the past survey-based VOS study. Hence, it would violate the order and intentions of D.04-10-034.

PG&E responded:

- E3's market-based approach will be implemented using data that includes consumption and outage data in recent years. The use of historic data is necessary to assess the trend in consumption behavior and the related VOS. Once completed, however, the VOS estimation models can be used to make VOS predictions using data assumptions that reflect current and future consumer behavior.

Electric Supply Availability May Not Be a Major Determinant in Non-Residential Production Costs

Both CUE and TURN stated that electric supply availability may not be a "key driver" of non-residential production costs. Furthermore, supply could not be disentangled easily from other major determinants such as output level and input price.

A Market-Based Approach Does Not Take into Account the Detailed Outage Attributes Needed to Calibrate Performance Incentives

CUE and TURN also maintained that the market-based approach does not distinguish among outage characteristics such as frequency and duration needed to support CPUC outage performance incentive programs.

CUE and TURN Recommend the Meta-Study Proposed by FSC

CUE and TURN recommended that the Commission adopt FSC's proposal that would combine PG&E's data with data from the meta-study to estimate PG&E's VOS in 2005.

Tiered and Regulated Rates Affect the Market-Based Approach

The Agricultural Energy Consumers Association (AECA) alleged that using billing data in the market-based approach could lead to misleading results. This is because: 1) rates are tiered to usage, particularly for residential customers, hence, a customer essentially chooses a marginal price in which to charge his consumption and this would create an endogenous variable problem in estimation; and 2) rates are set by regulation, not the market. Hence, they do not float with changes in demand.
PG&E responded:

- There are well-known solutions that tests for the presence of and proposes remedy for the endogenous variable problems.
- Since regulation and not an individual customer's consumption that sets the tier rate structure and each tier's rate level, the tier rate structure and its associated rate levels do not have the endogeneity problem described by AECA.

A Market-Based Approach may not Produce the Necessary Short-Run Price Elasticity Estimates for NonResidential Customers

AECA stated that the Statewide Pricing Pilot (SPP), which is testing critical peak pricing (CPP), has developed appropriate measures of short-term price elasticities. However, the SPP focuses almost solely on residential customers. Hence, if a VOS study did not use a survey it could rely on the SPP results for residential customers but still would need to develop comparable data for the other rate classes.
PG&E responded:

- E3 will investigate using CPP price elasticity results to infer residential VOS.

A Market-Based Approach will Not Capture the Likely Dynamic Effect Associated with How a Customer Values Reliability

AECA pointed out that an outage in one hour may affect electricity usage in subsequent hours. A full outage has a different effect than reduced or partial usage. Hence, the Market-based approach would estimate the demand elasticity for a single unit of use and would not capture this interdependence of use across units, or the implications of full outages.
PG&E responded:

- VOS estimates are for full outages. The billing data reflects monthly consumption; and therefore it accounts for a customer's consumption response to outages over the course of a month. Hence, the resulting VOS estimate capture the net effect of outages on monthly consumption, allowing for the possibility that a customer may make up consumption after an outage.

AECA Recommends Considering Other VOS Studies

AECA states PG&E should investigate using one of the following methods:

- Examine how participation in interruptible tariffs changed before and after the 2000-2001 energy crises. The difference in participation before and after interruptible tariff would reveal their WTP for enhanced service.
- Analyze by location and industry their likelihood of having a backup generator could reveal a WTP for added reliability.

PG&E's responses to these two suggestions appear at the end of the following DISCUSSION section.

DISCUSSION

Energy Division reviewed the Advice Letter and protests, along with PG&E's response to these protests, and to Energy Division's questions.

The Selected VOS Study Method Should Yield Responsive, Timely, Comparable and Understandable Results

Energy Division's recommendation is based on the following criteria:

- The selected study should produce the **results ordered** by the CPUC using **available data**.
- The study should yield **results in time** for PG&E's next GRC.
- The selected study should yield **results that can be compared** with prior studies.
- The accepted methodology should have a **reasonable cost** as compared to its potential benefits.
- **Understanding** the study method and results should not require a technical background.

The Proxy Method

The Proxy method is low cost but too simple to link important outage details with value of service.

The Survey approach

Contingent Valuation (CV or Survey) methods have been long used in VOS literature. The proposal by FSC was for a survey-based study that it would complete by September 1, 2005 for $540,000. PG&E's last VOS Study in 1993 used a survey-based method. Some questions in a survey are difficult for the survey respondent customers to answer with a dollar value, and to some questions the responder will have an incentive to answer higher or lower than actual behavior.

- Advantages
  - It is a well known approach
  - There is an extensive amount of survey-based VOS literature.
  - It can yield detailed outage attribute information (WTA and WTP).
- Disadvantages
  - Lengthy and costly process.
  - Responses to survey questions vary widely.
  - If customers give "protest" or "strategic" responses then survey results may not match actual customer behavior.
  - It may be difficult for residential customers to place a dollar-value service interruptions since they do not buy and sell them.

The Market-based approach

The Market approach was developed more recently than the Survey method. Because it involves economic theory it is more complex but it has been evaluated in scholarly journals and is often applied. The proposal by E3 for a Market approach would yield results within six months, for $249,200 or less than half the cost of the Survey-based proposal.

Protesters raised concerns about Market method results not reflecting the bulk of PG&E's customers and about being unable to compare those results with existing prior pre-energy crisis results.

- Advantages
  - It uses data that reflects actual customer behavior.
  - The market-based model may be updated by utility staff without incurring future data collection costs.
- Disadvantages
  - It is a more complex approach.
  - It yields limited Outage attributes (WTA and WTP)
  - It is a less well-known and utilized approach.
  - The data may not support solid conclusions.
  - Constraints in customer billing and interruption data may impact the analysis.

Two Other Approaches as Proposed by AECA Appear Unlikely to Yield a Broad Representative Study

Examine whether lower participation in interruptible tariffs after the 2000-2001 energy crisis reveals a WTP for firm service

Participation in interruptible tariffs changed after the energy crisis but interruptible customers are only a small part of the total customer base. PG&E's protest response stated that this approach is limited and cannot produce useful data, because it can only produce VOS estimates for customers who had volunteered to join the interruptible/curtailable rate programs before the energy crisis. Obtaining VOS estimates from this small sample would not be representative of PG&E's large customer population.

An analysis by location and industry of backup generator installations could reveal a WTP for added reliability

While this approach could yield WTP data, PG&E explained in its protest response that most customers owning backup generation prefer not to reveal their generation cost data. Therefore the data collected could not readily be used to infer trade-off between cost and reliability from a customer's perspective.

CONCLUSION

Market-Based Study Results Cannot Be Compared with Survey-Based Study Results

Both the Survey- and Market-based methods offer benefits. The cost difference is not significant considering the potential improvement in managing and allocating PG&E's electric distribution revenue requirements, which was $2.493 billion for Test Year (TY) 2003. However, it would be a challenge to do a credible comparison of new market-based VOS study results with the 1993 survey results, since they are based on different sets of assumptions and methodologies.

The Survey-based Approach Meets All the Criteria

Staff received no comments opposing the Survey-based methodology. Only the Survey-based VOS would allow the comparison with PG&E's existing 1993 survey results and result in the best analysis of changes in VOS perceptions since the California energy crisis. The survey-based approach has its limitations, but it would best meet our overall objectives. It also allows ratepayers to directly voice their opinions and to participate in our decision process. Energy Division recommends that the Commission deny Advice Letter 2616-E and direct PG&E to conduct a Survey-based VOS study.

COMMENTS

Public Utilities Code section 311(g)(1) provides that this resolution must be served on all parties and subject to at least 30 days public review and comment prior to a vote of the Commission. Section 311(g)(2) provides that this 30-day period may be reduced or waived upon the stipulation of all parties in the proceeding.

The 30-day comment period for the draft of this resolution was neither waived nor reduced. Accordingly, this draft resolution was mailed to parties for comments, and will be placed on the Commission's agenda no earlier than 30 days from today.

PG&E submitted the following comments on the draft resolution in a letter dated April 6, 2005:

- It accepted the decision to proceed with a survey-based VOS study.
- It proposed to extend the study completion date from September 1, 2005, to allow FSC to complete the study before PG&E files its 2007 GRC application.
- It requested authorization to record costs associate with the VOS study in a Streamlining Residual Account pending review and rate recovery.

The Energy Division finds that it is reasonable to extend the completion date beyond September 1, 2005, as long as PG&E submits results of the VOS study with its 2007 GRC application.

A Streamlining Residual Account (SRA) is a cost recovery account that tracks intervenor compensation payments and Commission imposed rate case expense obligations. Each payment has been authorized by a Commission decision. Electric Preliminary Statement Part BF shows the specific entries into this account. The Energy Division recommends the Commission to allow PG&E to record debit entries to the SRA equal to the amounts of study's invoices. However, invoices are limited to scope of work required under D.04-10-034, and the Streamlining Residual Account is pending review and rate recovery.

FINDINGS

1. Commission Decision 04-10-034 directed PG&E to file an Advice Letter to recommend a method to conduct a customer VOS study.
2. The Decision also specified that the new VOS study, at a minimum, should include a "willingness to pay (WTP)" element.
3. PG&E submitted an Advice Letter on January 21, 2005 and recommended a market-based method to conduct a customer VOS study.

4. A Value of Service study (also called an outage cost study) provides a means to quantify the value customers place on reliable electric service.
5. Proxy, Contingent Valuation (CV), and Market-based are three categories of methods commonly used to quantify VOS.
6. Each approach to the VOS study has advantages and disadvantages.
7. The study would address customer classes in residential, small/medium commercial/industrial, large commercial/industrial, and agricultural.
8. The last PG&E VOS study of each customer class was made in 1993.
9. Freeman, Sullivan & Company (FSC) proposed a survey-based VOS study method and Energy and Environmental Economics Inc. (E3) proposed a market-based method.
10. FSC proposed to use historic data from prior surveys to compare and project new survey results, to conduct new customer surveys, and to present results in analysis tables and customers damage functions.
11. FSC proposed to complete the study by September 1, 2005 with a total budget of $540,000. However, in its comments on the draft resolution dated April 6, 2005, PG&E recommended extending the study completion date beyond September 1, 2005, as long as FSC completes the study before PG&E files its 2007 GRC application.
12. E3 recommended using economic theory and billing data and two separate methods in order to estimate WTP.
13. E3 would complete the entire project within six months of the contract award date with a total budget of $249,200.
14. Pacific Gas and Electric's Advice Letter AL 2616-E was timely protested by the Aglet Consumer Alliance (Aglet), the Agricultural Energy Consumers Association (AECA), the Coalition of California Utility Employees (CUE), and the Utility Reform Network (TURN).
15. Pacific Gas and Electric responded to the protests of the above parties on February 16, 2005.
16. It would be difficult to compare or combine market-based study results with survey-based results since they are based on totally different assumptions and methodologies.
17. Energy Division recommends that the Commission:
    - Deny Advice Letter 2616-E and instead order PG&E to conduct a survey-based VOS study.

- Extend the study completion date beyond September 1, 2005, as long as PG&E submits results of the VOS study with its 2007 GRC application.
- Allow PG&E to record the study invoices as debit entries to a Streamlining Residual Account. However, invoices are limited to scope of work required under D.04-10-034, and the Streamlining Residual Account is subject to review before recovery in rates.

THEREFORE IT IS ORDERED THAT:

1. The request of Pacific Gas and Electric (PG&E) in Advice Letter AL 2616-E to perform a customer value of service study using a market-based method is denied. PG&E is directed to file in its next General Rate Case the results of the survey-based value of service study also described in AL 2616-E. PG&E may record debit entries to a Streamlining Residual Account equal to the amounts of study's invoices. However, invoices are limited to scope of work required under D.04-10-034, and the Streamlining Residual Account balance is subject to review before recovery in rates.

This Resolution is effective today.

I certify that the foregoing resolution was duly introduced, passed and adopted at a conference of the Public Utilities Commission of the State of California held on April 21, 2005; the following Commissioners voting favorably thereon:

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STEVE LARSON
Executive Director

MICHAEL R. PEEVEY
PRESIDENT
GEOFFREY F. BROWN
SUSAN P. KENNEDY
DIAN M. GRUENEICH
Commissioners